European Network for Future Crop Production
Proposal for an Integrated Crop Production partnership – a public-private collaboration

Brussels, 2017
Summary

Vision and mission statement

Collective systems approach

Introduction and background

Global and European initiatives

Stakeholder needs and relevant focal areas for R&I

R&I cross-sectorial connections

ICP and policy environment

European added value and impact

European added value

From lab to market

Performance indicators

Implementation and governance

Impact

List of partners and relevant stakeholders

ICP cPPP

Annex
Table of contents

Summary .............................................................................................................................................. 4

1. Vision and mission statement ........................................................................................................ 6

2. Introduction and background ........................................................................................................ 7
   2.1. Introduction .................................................................................................................................. 7
   2.2. Background .................................................................................................................................. 8

3. Stakeholder needs and relevant focal areas for research and innovation .................................... 11

4. European added value and impact .................................................................................................. 16
   4.1. Metrics and monitoring performance .......................................................................................... 18

5. Implementation and governance ...................................................................................................... 20
   Governance structure ....................................................................................................................... 22

6. List of partners and relevant stakeholders ...................................................................................... 23

Annex 1 Related initiatives and committees ...................................................................................... 26

Table of figures

Figure 1: Collective systems approach across sectors ......................................................................... 7
Figure 2: Global and European initiatives shaping the agricultural research and innovation landscape ..................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................
Summary

The Integrated Crop Production (ICP) partnership is an industry driven public-private collaboration that targets the need of the whole European agricultural value network to innovate sustainably. Europe and the world are facing major challenges in terms of food and nutritional security and safety, whilst mitigating impact of climate change, preserving human and environmental health and establishing a sustainable food system. The dimension of these challenges requires transition of the sector from a linear disciplinary approach to an integrated networking approach.

The ICP partnership aims at promoting an environment for its stakeholders, the Knowledge & Innovation system (KIS), that stepwise facilitates development of coordinated and collaborative innovation efforts. The aspiration is to offer this “KIS” environment to the stakeholder groups of the entire agricultural value network.

To establish a common language, arrive at joint understandings, learn from each other, mobilize resources, and develop positive externalities. In such a “system” knowledge is co-produced by all actors in the network and smartly established feedback loops should ensure that the outcomes of collaboration are usefully fed back into the research and innovation process. To maximize effectiveness, it is proposed to fully leverage ongoing European efforts such as the Agricultural KIS (AKIS), and build further on its strengths.

Integrating stakeholders in the research and innovation cycle offers a number of benefits. It may deliver innovations fit for purpose, higher novelty, higher success rates, reduced time-to-market, and lower costs, etc. The intrinsic value of the collaborations is that stakeholders innovate beyond their resources and make best use of internal and external ideas. Furthermore, engaging with consumers can increase the ability of the sector to develop a more agile approach to innovate and create value, as it allows to better understand customers’ needs and behaviours and their willingness to adopt products and their development accordingly.

The ICP partnership targets the following goals:

- Help to implement the Sustainable Development Goals, Bio-Economy-, Circular Economy- and the Energy Union strategies – e.g. by shifting industry towards renewable resources, developing solutions towards nutrient cycles and health cycles;
- Create a Knowledge and Innovation System with new Public-Private Partnerships (bilateral and also multilateral);
- Promote allocation of EU funding to strategic R&I areas to further build a highly competitive science and innovation base across Europe;
- Yield a competitive advantage for EU industry due to improved agro-technology and regulations;
- Secure a skilled workforce by state-of-the-art education and training;
- Increase productivity, resilience, resource-use efficiency and environmental performance;
- Provide higher quality food and non-food products.

The specific actions of this initiative are:

- To install for stakeholders stepwise a “KIS” resource, an innovation-oriented partnership development toolbox. Such toolbox will serve as a platform to:
  a) learn and benefit from previous successful & unsuccessful attempts to develop innovation-oriented partnerships (e.g. examples of joint initiatives, win-wins, legal framework, risk funding, R&D funding, etc.,)
  b) access information about the R&D capabilities of the participating stakeholders, their innovation interests & gaps, etc. The goal is that the stakeholder group collects, organizes, makes accessible, and maintains the “KIS” resource.
- To initiate and maintain the dialogue between the different sub-sectors of the agricultural value network and with external stakeholders across food systems;
- To set a common agenda of focal areas for research and innovation based on an integrated cross-sectoral approach;
- To create an open access point for parties who want to address the whole agricultural value network;
- To identify and make use of adequate financing mechanisms to implement the prioritized R&I activities;
- To promote public-private interfaces that address the focal areas for research and innovation;
- To define the foreseen impact of the activities and develop tools to assess this impact.

To meet the ambitions, this document explores different non-exclusive options for implementation:

1. **Contractual Public-Private Partnership** under an EU Research and Innovation framework programme based on a long-term commitment made by the ICP-stakeholders and the European Commission supported by adequate financial resources from public and private sector. The European Commission has developed the Contractual Public-Private Partnership as an instrument to foster the competitiveness and sustainability of European economy and industry.

2. **Self-funded network** that seeks adequate funding on a case-by-case basis for the individual activities. The network consists of volunteers and interested stakeholders from industry, the farming community and academia who will jointly address the preferred topics in the focal areas and develop financing mechanisms on a case-by-case basis.

3. **Joint stakeholder document** that reflects the needs of the stakeholders in the agri-food network and the focal areas for research and innovation, to be fed into ongoing initiatives JPI, ERA-nets, EU Framework Programme actions, JTI etc. with their own individual agendas and governance structures.

Depending on the mode of implementation a different level of integration and reach will be achievable from weak and fragmented Joint stakeholder document to strong and fully integrated cPPP. These are explained and assessed in more detail in section 5 (Figure 7).
1. Vision and mission statement

**Europe and the rest of the world** are facing complex challenges in terms of safeguarding food and nutritional security and safety, whilst mitigating the impact of climate change, preserving human and environmental health and establishing a sustainable agri-food system.

To provide future generations with sufficient safe and healthy food yields need to increase, be more stable and be more resource efficient. The impact of an increase in production on the environment needs to be reduced. The adaptation to and mitigation of climate change will require a joint effort to limit global warming to below the 2°C target.

The **vision** underpinning the proposed ICP partnership is a future-proof agri-food system that operates agile in response to changing customer demands and simultaneously demonstrates resilience towards variable abiotic and biotic stresses, harnesses the diversity of the biosphere, delivers superior alternatives to today’s fossil-based economies and fosters economic growth and social prosperity.

An **industry-driven ICP partnership will provide the organisational and coordination environment for an integrated approach by facilitating a KIS** to connect with already existing AKIS within European member states. This will ensure consistency of AKIS and further development into training and technology transfer systems that involve all actors along the research and innovation cycle. The goal is, to develop and diffuse knowledge to inspire and identify opportunities, mobilise resources, help managing risks and forms markets, legitimise activities and develop positive externalities. In such system knowledge is co-produced by all actors that engage with each other in processes of learning and co-evolution. A cornerstone of the KIS platform is that it will allow users to learn and benefit from previous innovation-oriented partnerships, and offer insights which stakeholders are well positioned to work out a particular partnership opportunity.

The process of increasing crop productivity, quality and sustainability needs the coordinated commitment of all sectors involved. This approach entails a smart combination of disciplines generating and transferring complementary knowledge. The **transition from a linear approach to an integrated cross-sectoral approach requires collaboration throughout the network, with feedback loops**, so that the outcomes are appropriately fed back into the research and innovation process. The ICP initiative aims at serving as the wiring between top-down Member States’ and European Commission strategies and programmes and bottom up public-private initiative by fostering mutual understanding of different stakeholders, co-creating research and innovation outcomes, and providing input for a consistent agri-food policy agenda. It will enable new means of finding solutions, new ideas for cross-overs with neighbouring sectors such as chemistry, health, logistics, energy, water, high-tech

---

systems and materials, and it will facilitate access to a vivid agri-food community that extensively interacts to speed up the transition towards a sustainable agri-food system.

Figure 1: Collective systems approach across sectors. This partnership proposal envisions aligned efforts of the sectors Plant Breeding, Crop Protection, Fertilizers, Agricultural Engineering, Precision Farming, Big Data, Non-food (such as plant-based Fibre/Textile, Bio-Fuel, Bio-chemistry) and plant-based Primary Food Production and -Processing. The ICP initiative will define a relevant member group of preferred partners and supporting companies but reaches out to other sectors/initiatives that would be beneficial for the shared ambitions. Associated industries like flour-milling and sugar, starch, cocoa, vegetable protein and-oil processing industry have been identified as relevant actors in the network.

2. Introduction and background

2.1. Introduction

This is a proposal to set out the boundaries for a public-private collaboration for ICP in Europe. The ICP partnership aims to leverage a commitment from industry, the farming community, academia, and policy/society to develop and implement a platform facilitating implementation of a common roadmap of activities towards 2030. As a collective sector effort, it will seek suitable financing models to generate essential critical mass and foster true integration across the agricultural value network. To set up this initiative, investments from both the public and private side are desirable. European, national and regional public-private (co)funding schemes will be explored to confirm their compatibility with this initiative.

The agri-food sector fulfils the basic requirements of a key sector for European competitiveness and economic growth. Therefore, it is considered timely to elaborate further a partnership that unites,
facilitates and bundles the concerted actions of stakeholders across the agricultural value network. The backbone for this document was developed by the members of the European Technology Platform “Plants for the Future”. These are stakeholders from plant-related industry, the farming community and academia. To cover the full scope of the agricultural value network they also reached out for interviews to neighbouring sectors and companies like European Crop Protection Association, International Biocontrol Manufacturers Association, European Agricultural Machinery Association. The feedback from the interviews and the results of a written online survey covering about 100 stakeholders from industry, the farming community and academia have been incorporated in this proposal.

2.2. Background

A multi-year list of ambitions for research and innovation has been developed considering the societal challenges that Europe and the world are facing. In view of these ambitions, the activities that are promoted by this initiative are designed to be aligned with the principles of the following policies and initiatives:

**Global level**

1. **Sustainable development goals** (SDG); in September 2015, the world’s Heads of State and Governments adopted the 2030 Agenda for Sustainable Development and its 17 Sustainable Development Goals (SDGs). These goals will frame global action on sustainable development until 2030 and at least nine of SDGs are of direct relevance to Food and Nutritional Security (FNS).

2. **Climate action** (COP21); highlighting the threats to FNS from climate change. Over the coming years, the Intergovernmental Panel on Climate Change (IPCC) will prepare special reports on oceans, climate change, desertification, land degradation, sustainable land management, food security and GHG fluxes in terrestrial ecosystems.

**European level**

3. **Digital Single Market for Europe**; the availability of high-speed broadband Internet and access to digital service infrastructures are the elementary units of a digital single market, allowing communication, data storage and- sharing, services and business to grow - allowing areas such as e-commerce and e-government to exploit their full potential.

4. **The Circular Economy**; as a viable alternative to depleting fossil fuels and as a sustainable natural alternative in the shift to a post-petroleum society. The strategy streamlines existing policy approaches in this area, and is structured around investments in research, innovation and skills; reinforced policy interaction and stakeholder engagement; enhancement of markets and competitiveness.
5. **The Bio-economy Strategy**: addressing the production of renewable biological resources, the reduction of related waste streams and their conversion into vital food, feed, bio-based products and bio-energy.

6. **The Energy Union strategy**: making energy more secure, affordable and sustainable. It will allow a free flow of energy across borders and a secure supply in every EU country, for every European. It will lead to a sustainable, low carbon and environmentally friendly economy, putting Europe at the forefront of renewable energy production and the fight against global warming. In line with the Paris Agreement the European Commission (EC) presented a legislative proposal in 2016 to integrate greenhouse gas emissions and removals from land use, land use-change and forestry (LULUCF) into the 2030 climate and energy framework. The proposal follows the agreement with EU leaders in October 2014 that all sectors should contribute to the EU's 2030 emission reduction target, including the land use sector.

7. **The FOOD2030 initiative** of the EC; aiming for integration of the global and European policy principles towards a coherent policy framework. FOOD 2030 is a EU research and innovation policy response to the recent international policy developments including the SDGs and COP21 commitments.

8. **A strategic approach to EU agricultural research and innovation** initiated by DG-AGRI regarding land-based primary production, centred around agriculture and forestry, but also extending to food and non-food chains and the rural economy.

9. **The 4th SCAR Foresight exercise** aimed to identify emerging research questions and to anticipate future innovation challenges that can support the implementation of the Bio-economy Strategy for Europe.

The relationship between the identified focal areas for research and innovation with the above policies will be spelled out in more detail in section 3.

When preparing the list of ambitions and focal areas, various other European initiatives have been studied and compared and relevant issues have been taken on board. For instance, the Food4Life Technology Platform\(^2\) stresses the need for more consumer engagement and involvement in the development of novel/improved food products. This informed involvement and the need for transparency reaches out to the primary production processes, breeding and growing. Food safety and nutritional value for human and animal health are important assets in this dialogue. The recently selected EIT Food KIC “Food Connects” will boost knowledge generation and transfer for innovation in the field of safe and sustainable food production. The ICP initiative will benefit from and seek interaction with this education- and innovation hub.

Initiatives like ESFRI-EMPHASIS (European Multi-Environment Plant Phenomics and Simulation Infrastructure) demonstrate the need for appropriate infrastructure to speed up the assessment and

---

\(^{2}\) Strategic Research and Innovation Agenda of the European Technology Platform Food for Life; 3rd draft, July 15th, 2016
improvement of plant performance under changing environmental conditions. The ESFRI-ANAEE increasingly includes infrastructures for agronomy. The Alliance for Internet Of Things initiative, which will also look at smart farming, crop-protection and livestock production, shows how the connectivity between resources (data and hardware) may boost innovation. There is also good alignment with the objective of integration of big data throughout the ICP initiative.

At the national level, many European countries have developed or are developing their bio-economy strategies, stressing the need for more integration and coordination on the trans-sectorial, transnational and the multi-layered funding level. The regional authorities indicate in their smart specialisations strategies, agri-food as a priority area, also pointing towards a need for more leverage of the macro-regional dimension. The UK study called ‘FoodFutures’ made an in-depth analysis of topics that are of importance to delivering a more sustainable, resilient food system in the coming decade, resulting in a priority list like the one in this initiative. Closer integration of the various sectors involved appears to be a crucial element to tackle the challenges.

Figure 2: Global and European initiatives shaping the agricultural research and innovation landscape. The ICP partnership aims at providing wiring between the different initiatives to facilitate the development of innovation-oriented partnerships across the Agri-cultural value chain.

The complexity of the challenges ahead requires a smart interaction of the four stakeholder groups representing industry, the farming community, academia and politics/society. The next chapters will

---

3 “Added value of macro-regional strategies”, Interact, Project and programme perspective, final report of the study, 2017, Spatial Foresight GmbH, Germany
4 “FoodFutures – from business as usual to business unusual” 2016, WRAP, UK
describe how the initiative aims to create the right incentives for all stakeholders while paving the way towards resilient and sustainable value chains for food and other bio-based systems.

3. Stakeholder needs and relevant focal areas for research and innovation

The challenges of productivity and sustainability that the world is facing translate into a multitude of opportunities for innovation across the complete agricultural value network – from inputs and crop production – to transport, processing, distribution, storage, retail/consumption and waste disposal. Integration at various levels of research and innovation will maximise impact. The dialogues and exchanges between different stakeholders should be multidirectional, creating opportunities for novel cross-overs in the bio-economy. The ICP partnership will facilitate this multidimensional perspective. This includes looking from the science base to crop production, processing and retailing, as well as from an end-user perspective to crop production and biological research (fig. 3).

Figure 3: Cross-sectorial connections between research and innovation – the KIS platform will translate this to stakeholder innovation opportunities and accelerate innovation-oriented partnership development.

Plant science and breeding can contribute to the challenges of food and nutritional security by developing and producing plant raw materials for food products, providing tailored plants for specific health benefits and reducing or eliminating potentially harmful compounds to improve safety of food.
According to a recent study\(^5\), since 2000, EU innovation in plant breeding has significantly improved the global food supply - enough to feed an additional 160 million people with kcal. Regarding human and animal health improvement, plant compounds are sustainable and highly nutritious alternatives to replace marine ingredients in human food and fish and cattle feed. Plant breeding can contribute to the development of plants with improved composition.

The KIS, system that stepwise integrates people, organisations and funding schemes, will facilitate co-creation of knowledge to generate and utilize agriculture-related innovation within the predefined but non-exhaustive list of focal areas shown below:

- **Focal area 1: Increased yield and yield stability of crops in dynamic and adverse environments**  
  *E.g. Development of improved crop resistance management programs and strategies; Novel strategies for reduced crop loss both before and after harvest (including storage and transportation); Improved photosynthetic efficiency to enhance yield potential; Designing the varieties of the future which combine resilience targets with quality targets; Diversifying plant production: more plants with higher yield potential, yield stability and quality.*

- **Focal area 2: Improved resource use efficiency and resource stewardship**  
  *E.g. Enhanced decision support tools to optimize fertilizer and water use and application, more effective management of soil and water resources; Increased automation and robotics to optimize cultivation and harvesting strategies; Increased efficiency in fleet-management of agricultural machinery potentially yields reduction in fuel consumption and consequential reduction of CO\(_2\) emissions; Losses and waste reduction, savings on GHG emissions and recycling are relevant topics throughout the value chain including food-production and the various supply chains; Use of big data opportunities for growth monitoring / long term yield prediction; Life cycle assessment across the chain of new products and solutions, end to end, will help to monitor their impact.*

- **Focal area 3: Improved plant health for resilient production**  
  *E.g. Co-designed plant and biological/chemical protection systems and bio-stimulants; Development of biocontrol products and strategies; Improved resistance management of current solutions; Development of EU-wide IPM compatible protection approaches; Design of new strategies to tackle disease drift associated with climate change; Improved pre- and post-harvest seeds and crop protection technologies.*

- **Focal area 4: Increased food safety**  
  *E.g. More cross-sector insights in potential hazards compromising the safety of crop and food production and processing and ways to mitigate them (how to fight salmonella toxin contamination in human food or animal feed? How to limit mycotoxin production in crops with*  

---

a reduced number of certified chemical fungicides? How to mitigate the formation of acrylamide in bread?)

- **Focal area 5: Enriched/enhanced plants for healthy food and for non-food products**
  E.g. Healthy enriched human nutrition & animal feed including reduction of non-beneficial compounds;
  Design of novel foods meeting the needs of a 21st century lifestyle, including reduced sugar levels/reduced need for salt / resistant starch / satiety stimulators etc.;
  Increased understanding of which phytonutrients promote health and protect against chronic diseases;
  Use of bio-fortification to increase micronutrients and / or increase health-beneficial compounds and enhancing their bioavailability;
  Develop new minimal food processing technologies that exploit the potential of the raw material and retain or enhance their nutritional qualities.

- **Focal area 6: Agronomical strategies**
  E.g. Optimizing choice of crop, variety, rotation, cultivation and management, development of improved decision support tools to optimize farm-level management decisions and input use efficiency;
  Design of more efficient novel fertilization and irrigation strategies.

- **Focal area 7: Regulatory affairs**
  E.g. Regulatory authorities should be enabled to benefit more from integrated scientific evidence when translating results into new legislation (cf. risk-based approach regarding approval of crop protection measures versus a hazard-based one).

- **Focal area 8: Big data and data management**
  E.g. Big data management tools create opportunities to analyse cross sectorial information and enable smart decision taking, however it also touches upon issues like the question of data protection; Solutions to apply an open access policy while protecting the individual interest both private as commercial of stakeholders when sharing their data;
  Better integration of data across chain-relevant factors.

- **Focal area 9: Consumer research, drivers for consumer acceptance and behavioural change**
  E.g. Increasing the availability and usefulness of existing and new tools and technologies in consumer science applied to food;
  Design and implementation of public engagement mechanisms by involving specialists and non-specialists. Building consumer trust by making the information flow from the different sectors more transparent is essential; Improving communication and outreach of society at large;
  Increasing knowledge and technology transfer at all levels; especially connectivity with the farming practise (e.g. an integrated network of demonstration farms in Europe to foster feasibility of new technology in the farming practise and for dissemination purposes).

- **Focal area 10: Infrastructure**
  E.g. Facilitate the advancement of and access to state of the art research- and farming infrastructure in the agri-food sector is highly relevant: to identify gaps an analysis of the research- and farming infrastructure landscape should be performed.

- **Focal area 11: Finance, investment models and economic performance**
E.g. Risk-sharing of innovative farming types. Risk sharing among a group of local farmers could lower the threshold to embark in innovative production processes. In Italy first pilots are running already (e.g. Maize Mutual Fund Veneto).

Development of economic performance indicators will enable the assessment of the impact of the activities that are promoted by the ICP initiative.

For each of the listed focal areas the embedding in the larger EU policy environment has been indicated below in Figure 4.

<table>
<thead>
<tr>
<th>Focal areas tackled by the ICP partnership through coordinated and collaborative efforts</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Increased yield and yield stability for increased resilience of crops in dynamic and adverse environments</td>
</tr>
<tr>
<td>2. Improved resource use efficiency and resource stewardship</td>
</tr>
<tr>
<td>3. Improved plant health for resilient production</td>
</tr>
<tr>
<td>4. Enhanced food safety</td>
</tr>
<tr>
<td>5. Enriched/enhanced plants for food and for non-food products</td>
</tr>
<tr>
<td>6. Agronomical strategies</td>
</tr>
<tr>
<td>7. Regulatory affairs</td>
</tr>
<tr>
<td>8. Big data and data management</td>
</tr>
<tr>
<td>9. Consumer research, drivers for consumer acceptance and behavioural change</td>
</tr>
<tr>
<td>10. Infrastructure</td>
</tr>
<tr>
<td>11. Finance, investment models and economic performance</td>
</tr>
</tbody>
</table>
**SUSTAINABLE DEVELOPMENT GOALS (SDGs)**

The Integrated Crop Production (ICP) partnership directly addresses: SDG 17 “Partnership for the goals”

SDG 1: “No poverty”
SDG 2: “Zero hunger”
SDG 3: “Good health and well-being”
SDG 4: “Clean water and sanitation”
SDG 5: “Affordable and clean energy”
SDG 6: “Decent work and economic growth”
SDG 7: “Industry innovation and infrastructure”
SDG 9: “Yesterday agriculture”
SDG 10: “Develop urban agriculture”
SDG 11: “Responsible consumption and production”
SDG 12: “Climate action”
SDG 13: “Life on land”

**OTHER GENERAL EU POLICY**

1. The circular economy
2. The energy union
3. Digital Europe
4. Climate action (COP21)
Figure 4: Embedding of ICP focal areas in global and EU strategic policies

4. European added value and impact

Europe counts many (trans)national, regional and local partnerships/initiatives that foster a sustainable and productive agricultural value chains. The critical mass is there in principle, both in ideas and actors. However, the individual actors tend operate in their own silos and therefore rarely any focus on open innovation opportunities within the agricultural value network that are beyond their regular R&D or business perimeter.

What is lacking is a sector-driven European framework as proposed here, to facilitate the network, to thrive and achieve higher impact innovation and to maximize the value creation within the entire agricultural value network. The leverages in the various focal areas that are listed in chapter 3 will impact on food and nutritional security issues that are identified on a European and global scale.
The envisaged activities across the agricultural value network will yield benefits in the bio-economy— which will add value and create jobs in the rural regions where they are needed. The growing and dynamic network shall provide an ideal opportunity to attract highly skilled workers and investment towards urban- and rural areas, foster economic growth and become a driver for competitiveness and development. The proposed initiative is the tool to set all this in motion.

The future success of the European bio-economy depends on secure, high quality, tailor-made food, feed, smart molecule and biomass supply in a sustainable and competitive way. Cross-overs with other fields are essential. Research breakthroughs are most needed on the pre-commercial (pre-competitive) side, the insights that constitute the basis for meaningful innovation may originate from multiple directions from in and outside the value chain. It is however the role of the value chain holder to translate innovation to marketable products reaching the broadest basis of customers possible. This inclusive approach requires a deviation from the past way of working, and would benefit from a “platform” to promote and facilitate the new way of working. The proposed ICP partnership, as a focal point for all major public and private stakeholders, will become the crucial enabler for a competitive and integrated European crop production for food, feed and non-food applications and will demonstrate the high potential of the bio-economy.

Figure 5: European added value of the Integrated Crop Production Platform within the EU Bio-economy landscape. The ICP platform will close the gap between the European and Member States’ (MSs) strategies and programmes, the regional RIS3 strategies and bottom-up public-private initiatives and will make the bio-economy value network operational.

The proposed ICP partnership offers a next generation implementation instrument for the top-down initiatives of the European Commission (e.g. the EU Framework Programme for Research and Innovation and the CAP) and the Member States (ERA-Nets, JPIs) and bottom-up activities (BioBased Industries Joint Technology Initiative-PPP, KIC Food Connects, ETPs active in agricultural R&I) by enabling public-private partnerships that will co-create new knowledge across the European agri-food network and spin-off new business-models based on this knowledge.
4.1. Metrics and monitoring performance

To monitor the socio-economic and environmental performance of the integrated agricultural value network one needs to identify the critical steps in the innovation process from the lab to the market. The development and uptake of innovative solutions in the agricultural value network will depend strongly on novel research findings, efficient knowledge and technology creation, greater investment in innovation by venture capital and appropriate regulation.

<table>
<thead>
<tr>
<th>Ensure innovation success</th>
<th>Increase innovation predictability</th>
<th>Improve innovation coordination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Secure critical scale in basic &amp; applied research and cost &amp; time to market</td>
<td>Develop public-private interfaces to enterprises</td>
<td>Engage with farmers &amp; consumers in the innovation process</td>
</tr>
<tr>
<td>Enable the use of all processes and technologies</td>
<td>Anticipate skills needs in the entire sector</td>
<td>Integrate &amp; make data &amp; knowledge accessible across the value chain</td>
</tr>
</tbody>
</table>

Figure 6: Flow-chart of actions from lab to market, to stimulate plant-based innovations. Actions are clustered according to their impact on innovation success, predictability and coordination. Derived from “Building Sustainable Innovation Leadership in European Agriculture”; Based on an Innovation Action Plan to 2020” ETP Plants for the Future, Brussels.

On the one hand, whilst knowledge creation and exchange is the basis for progress, research goals need to be firmly oriented towards the real needs of farmers and end-users, extending beyond knowledge generation per se. At the same time, the regulatory environment must encourage innovation, by stimulating new products to enter the market and lowering barriers to market access. A systematic approach is required, in which regulatory processes and research outputs are well connected in order to overcome obstacles to market access and capture the full value of research and investment.

The Figure 6 above shows the basic flowchart of the process that should lead to plant-based innovations. It shows potential bottlenecks that may delay the market introduction of the innovation and therefore require key actions that drive the process. The smart integrative combination of data,
knowledge and human capital across the chain will offer opportunities to speed up the time to market and boost innovation in crop production. The following performance indicators are derived from the key actions and will allow the monitoring of progress and to identify white spots that need more focus.

<table>
<thead>
<tr>
<th>Key action</th>
<th>Impact milestones</th>
<th>Performance indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Secure critical scale in basic and applied research</td>
<td>Leverage effect on EU spending; Research multiplier of results and knowledge delivering an additional volume in research activity for the stakeholders</td>
<td>Number of unlocked funding schemes, private investment and funded integrative cross-sector research projects</td>
</tr>
<tr>
<td>Reduce cost and time to market for innovative agricultural product improvement, production or development</td>
<td>Increase in productivity, resilience, resource-use efficiency and environmental performance</td>
<td>Number of EU initiatives that reduce cost and time to market for stakeholders</td>
</tr>
<tr>
<td>Develop a transparent approach to access data and resources</td>
<td>Yield a competitive advantage for EU industry due to improved agro-technology and regulations</td>
<td>Transparent approach to access resources</td>
</tr>
<tr>
<td>Develop public-private interfaces tailored for SMEs and large enterprises</td>
<td>Create a Knowledge and Innovation System (KIS) with new Public-Private Partnerships (bilateral and also multilateral)</td>
<td>Number of created interfaces</td>
</tr>
<tr>
<td>Improve sustainability and global leadership through regulation, standards and procurement</td>
<td>Yield a competitive advantage for EU industry due to improved agro-technology and regulations and implement the Circular Economy and the Energy Union strategies – e.g. by shifting industry towards renewable resources, developing solutions towards nutrient cycles and health cycles</td>
<td>Number of created jobs in existing and start-up companies and number of supportive integrated projects and infrastructure</td>
</tr>
<tr>
<td>Anticipate skill needs in the entire sector</td>
<td>Secure a skilled workforce by state-of-the-art education and training</td>
<td>Number of established education and training programmes that provide the required skills and a well-trained workforce</td>
</tr>
<tr>
<td>Integrate farmers in the innovation process</td>
<td>Provide higher quality food and non-food products and increase in productivity, resilience, resource-use efficiency and environmental performance</td>
<td>Number of demonstration farms to check ethical, socio economic and technical feasibility of innovation and to communicate about the innovation</td>
</tr>
<tr>
<td>Engage with consumers in the innovation process</td>
<td>Provide higher quality food and non-food products</td>
<td>Number of consumer interfaces to check ethical, socio economic and technical feasibility of innovation and to communicate about the innovation</td>
</tr>
<tr>
<td>Integrate and make data and knowledge accessible across the entire value network</td>
<td>Yield a competitive advantage for EU industry to improved agro-technology and regulations</td>
<td>Number of supportive integrated projects and infrastructure</td>
</tr>
</tbody>
</table>

Table 1: Performance indicators for progress monitoring
5. Implementation and governance

This chapter explores the current options for implementing the ICP activities. Each of the options will be described briefly highlighting the pros and cons.

Three different options to proceed are compared:

1) Contractual Public-Private Partnership
2) Self-funded network
3) Joint stakeholder document

1. Contractual Public-Private Partnership under an EU Research and Innovation framework programme based on a long-term commitment made by the ICP-stakeholders and the European Commission. The European Commission has developed the contractual Public Private Partnership as a tool to foster competitiveness and sustainability of European economy and industry.

Main activities:

- To define a multi-year strategic roadmap with a timeline and a budget;
- To define and execute an annual work-programme with detailed topics for research- and innovation based on an integrated cross sector systems approach;
- To initiate and maintain the dialogue between the different sectors of the agricultural value network and with external stakeholders and thus wiring the existing gaps between the member-state’s – and EU initiatives and the public-private initiatives;
- To create an open access point for parties who want to address the whole agri-food chain;
- To promote public – private interfaces that address the focal areas for research and innovation
- To identify and make use of adequate financing mechanisms to implement the prioritized R&I activities;
- To define the envisaged impact of the activities and develop tools to assess this impact.

Pros: the long-term commitment of the stakeholders; there is a contractual arrangement with the European Commission that embeds the partnership in the work-programmes and ensures structural funding for the duration of the contract; all focal areas are integrated in the work-programmes through specific call-topics.

Cons: the contractual arrangement requires a legal entity/ association as contractual partner to take care of governance and the execution of the arrangement; both the public and private sector have to provide an average of match funding, whereas the public contribution will be >50% for more basic research actions and the private contribution will be > 50% for closer to market activities.

Governance: a legal entity needs to be identified as a contractual party to take care of management and implementation.

2. Self-funded network seeks adequate funding on a case-by-case basis for the individual activities.

The network consists of volunteers and interested stakeholders from industry and the farming community who will jointly address their preferred topics in the focal areas and develop financing mechanisms on a case-by-case basis.

Main activities:
- To initiate and maintain the dialogue between the different sectors of the agricultural value network and with external stakeholders and thus filling the existing gaps between the Member-States’ and EU initiatives and the public-private initiatives;
- To create an open access point for parties who want to address the whole agri-food chain;
- To set a common agenda of focal areas for research- and innovation based on an integrated cross sector systems approach;
- To promote public – private interfaces that address the focal areas for research and innovation;
- To identify and make use of adequate financing mechanisms to implement the prioritized R&I activities.

Pros: there is no need for the long-term commitment of the stakeholders; they can choose their preferred topics and apply for funding from a common pot that is collected from membership fees and specific joint investments, co-funded by ongoing public programmes.

Cons: no structural funding for all focal areas; presumed limited coverage of stakeholders; limited budget; short-term horizon of activities; contributing partners will take decisions in governance.

Governance: the network would need a structure to handle the operational issues and take care of the financial means in the common pot.

3. **Joint stakeholder document** reflecting the needs of the stakeholders in the agri-food network and the focal areas for research and innovation, to be fed into the ongoing initiatives JPI, ERA-nets, EU Framework Programme actions, JTI etc. with their own individual agendas and governance structures.

Main activities:
- To promote the integration of the focal areas in the ongoing programmes
- To promote public – private interfaces that address the focal areas for research and innovation
- To promote the integrated network approach in existing initiatives
- To identify adequate financing mechanisms to implement the prioritized R&I activities

Pros: there is no need for a governance structure; the document can be used by stakeholders as common advisory document from a large agri-food community

Cons: there is no budget upfront allocated for addressing the focal areas; there is no operational budget; there is no commitment from the entire agri-food stakeholder community.

Governance: there is no need for a governance structure.

Depending on the mode of implementation a different level of integration and strength will be achievable.
Figure 7: Expected impact of KIS in function of the implementation mode; ‘level of integration’ refers to the formal links between stakeholder groups. ‘Level of strength’ refers to allocated resources, overall participation of diverse actors and the impact on the entire agricultural value network.

Governance structure

The required governance structure will depend on the preferred option of implementation. In order to create a transparent entry-point for internal communication and a dialogue with the European Commission and other external partners, which is the case in option 1 and 2, a governance structure is proposed as shown in Figure 6. This structure allows for a swift coordination and reflects an adequate representation of all stakeholders. It also offers a platform for dynamic response to future challenges.

The tasks and responsibilities of the different entities have to be defined in a separate Terms of Reference (ToR) document.
Figure 8: Scheme of Integrated Crop Production PPP: Organization of a bottom up approach for advice on R&D funding: provide knowledge to improve legislation and to steer & mobilise investment in innovation, led by industry together with the farming community and academia. Interactions have been envisaged with a view to cooperating with the EU, aligning with member states and providing a link for exchange of views with the public.

6. List of partners and relevant stakeholders

This is an open initiative. Additional companies from the sectors included as well as other sectors, for instance from the food production, are most welcomed to join the initiative. Prospective partners in this EU-wide platform for sustainable EU crop production include:

Core partners:

AGRI-FOOD AND NON-FOOD INDUSTRY

Plant breeders and seed producers, fertilisers, manufacturers, crop protection, crop nutrition, farmer-co-operatives, agronomists, primary processors and bio-refineries, food and drink manufacturers, food retailers.

Relevant stakeholders – potential associate partners:

AGRI-FOOD INDUSTRY and FARMERS organisations

European and National Technology Platforms: ETP Plants for the Future, ETP ManuFuture (sub-platform: Agricultural Engineering), ETP for the Future of Textiles and Clothing, BIOVEGEN (Spanish Technology Platform for Plant Biotechnology)

European industry associations: European Seed Association (ESA), European Crop Protection Association (ECPA), International Biocontrol Manufacturers’ Association (IBMA), Fertilizers Europe, European Agricultural Machinery Association (CEMEA), European Biostimulants Industry Consortia (EBIC), International Foundation for Organic Agriculture (IFOAM), Sugar- and milling industries
Farmers' organisations: Central Union of Agricultural Producers and Forest Owners (MTK), European Landowners Organisation (ELO), Committee of Professional Agricultural Organisations (Copa), General Committee for Agricultural Cooperation in the European Union (Cogeca)

Private foundations and associations: Fundacion Cajamar, Consebro, Aimcra, Fundacion Cartif, Fundacion Aula Dei, CTAEX

SCIENCE BASE

European Plant Science Organisation (EPSO), Research institutes, universities, levy bodies, national scientific academies and European science associations

Links:

PUBLIC AUTHORITIES

National governments, research councils and funding agencies, relevant ERA-Nets, JPIs, European Commission

NGOs

Environmental and conservation groups, think-tanks, consumers’ associations
Industry and cooperative participation

In alphabetical order:
Abengoa Bioenergy
Abiopep Plant Health
Ackermann Saatzucht
Adama
Aeskulap
Agri Obtentions
Agrícola el Bosque
Agritecno Fertilizantes
Airinov
Anecoop
Arvalis
Arvensis Agro
Axeb Biotech
Barenbrug
BayerCropScience
Bejo Zaden
Biofungitek
Biogemma
Biöiberica
Biopan
Böhm – Nordkartoffel
Agrarproduktion
Boreal
Camara Arrocera del Montsià
Camelina Company España
Caussade Semences
Certis
Cetiom
Citagro
Cooperativas Agro-Alimentarias de Aragón
Cultigar
CybeleTech
Deutsche Saatveredelung
DLF Trifolium
Enza Zaden
Ernst Benary Samenzucht
Euralis
Fagro
Fertinagro
FOSS
Fruits de Ponent Grup
Cooperatiu
Frutarix
Futureeco Bioscience
GenXPro
German Seed Alliance
Glen Biotech
Goëmar
Grupo Alimentario Citrus
Hi-Phen
HM Clause
HZPC
Idai Nature
Iden Biotechnology
In Vivo
Incotec
InnoPlant
Inveseed (Intersemillas)
Jacquet Brossard
John Deere
KeyGene
KWS
Lantmännien
Limagrain
Maisadour Semences
Meijer Ibérica
Monsanto
Nestlé
Newbiotechnic
Norddeutsche Pflanzenzucht
Hans Georg Lembke
Nordic Seed
Nordsaat Saatzucht
Norfolk Plant Sciences
NPZ Innovation
Persephone Bio
Phytowelt
GreenTechnologies
Plant Response Biotech
RAGT
Rebschule Steinmann
Rijk Zwaan Zaadteelt en zaadhandel
Roquette Frères
Royal van Zanten
Saatzucht Berding
Saatzucht Hege
Saatzucht Josef Breun
Saatzucht Steinach
Sapec Agro
SECOBRA Recherches (seed)
SEGES
Seipasa
Sejet Plant Breeding
Semillas Fito
Semillas Silvestres
SesVanderHave
Sistemas Genómicos
Sofiproptéol
Soufflet Group
Strube Research
Südwestdeutsche Saatzucht
Südzucker
Sumitomo-Chemical
Symborg
Syngenta
Takii Europe
Tany Nature
Unilever
ValGenetics
Vandel Potatoes
Vilmorin & Co
VisualNACert
Xtrem Biotech
Zery
Annex 1 Related initiatives and committees

Looking ahead towards the further development of the collaboration platform, an inventory of ongoing and planned initiatives on a EU scale will be drawn-up to avoid fragmentation and parallel tracks that are insufficiently connected. The identified initiatives need to be sorted according to the following categories *(to be completed)*

1. Horizon 2020 (Food2030; EU Agricultural Research & Innovation; Knowledge and Innovation Communities (KICs))
2. European Innovation Partnerships (EIPs)
3. Standing Committee for Agricultural Research (SCAR)
4. EU Food Sustainable Consumption and Production Round Table
5. EU Platform for Diet, Physical Activity and Health
6. Joint Programming Initiatives (e.g. FACCE-JPI - Agriculture, Food Security and Climate Change; HDHL-JPI - Healthy Diet for a Healthy Life)
7. ERA-Nets (CoFund, self-sustained etc.) e.g. ERA-CAPS, CORE-Organic Plus, SUSFOOD2, FACCE SURPLUS
8. JTIs established under FP7 and HORIZON2020 (e.g. BBI, IMI)
9. Contractual PPPs under FP7 and HORIZON2020
10. European Technology Platforms (ETPs)
11. High Level Forum for a Better Functioning Food Supply Chain
12. Sustainable Development Goals (SDG)